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Algorithmic competition – Note by the European Union

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1. Introduction

1. Over the last decade, there has been an intense debate about the impact of algorithms on the competitive landscape and about the role of competition enforcement in this respect. Several authorities and scholars have produced studies and reports on this topic.[1] There is consensus on the growing importance of algorithms in the new data economy and on the benefits that algorithms can bring in terms of efficiency gains. It is also generally recognised that competition law can and actually should play a major role, in particular to prevent the use of algorithms as a sophisticated instrument of collusion or abuse.

2. Despite the numerous studies, there are still a number of aspects of this new "algorithmic competition" that are not completely clear and where the discussion is ongoing. For instance, while the threat of algorithmic collusion is well understood, the application of other theories of harm to algorithmic conducts is not always straightforward. Similarly, an open question is whether new, specific tools and rules are necessary to enforce competition to algorithmic conducts, considering both the challenge in detecting such conducts and the apparently limited role of human behaviour. [2]

3. The next sections provide a brief summary of the interactions between algorithms and competition law. First, Section 2 discusses the notion of algorithm from a competition perspective. Section 3 then briefly illustrates beneficial effects of algorithms. Section 4 presents the main issues related to the application of competition law to algorithmic conducts. Last, Section 5 discusses the role of regulation and Section 6 offers a conclusion.

2. Algorithms

4. An algorithm is literally a procedure for solving a mathematical problem in a finite number of steps that frequently involves repetition of an operation.[3] In computer

[1] OECD (2017), Algorithms and Collusion – Background Note by the Secretariat, DAF/COMP(2017); European Union (2017), Algorithms and Collusion - Note from the European Union to the 127th OECD Competition committee on 21-23 June 2017, DAF/COMP/WD(2017)12; Bundeskartellamt and Autorité de la concurrence (2019), Algorithms and Competition; Competition and Markets Authority (2021), Algorithms: How they can reduce competition and harm consumers; OXERA (2018), Algorithmic competition; Ezrachi, A. and Stucke, M.E. (2016), Virtual Competition: The Promise and Perils of the Algorithm-Driven; Deng A. (2020), Algorithmic Collusion and Algorithmic Compliance: Risks and Opportunities; Sanchez-Cartas J. M., Katsamakas E. (2022), Artificial Intelligence, Algorithmic Competition and Market Structures; Rocher L., Tournier A.J., de Monjoye Y. (2023), Adversarial competition and collusion in algorithmic markets; Cheng, T.K. and Nowag J. (2023), Algorithmic Predation and Exclusion, 25 J. Bus. L. 41.

[2] What is already clear is that these new sophisticated digital tools and algorithms, combined with an exponential increase in electronic communications, the sheer quantity of data and the number of documents on case files render many competition investigations increasingly complex (EU Commission, Report on Competition Policy 2022, COM(2023) 184 final, p. 41).

[3] See https://www.merriam-webster.com/dictionary/algorithm.

programming terms, an algorithm is a set of defined instructions[4] to solve a particular problem, via turning digital inputs into a desired (digital) output. This last, specific notion of algorithm is relevant for the competition law perspective. In particular, for the present purposes an algorithm can be defined as an exact sequence of instructions that generate an output in a clearly defined format from a given digital input. Algorithms can include simple set of rules as well as very advanced machine learning or artificial intelligence systems. Sometimes the term is also used by competition authorities to refer more broadly to automated systems, i.e. a larger concept including the algorithm, data, models, processes, objectives, and how people interact and use these systems.[5] Conversely, other studies have focused on some specific category of algorithms. [6]

5. Algorithms have been used for decades, long before the current century, in order to manage all sorts of business processes, in particular in production, logistics and pricing decisions. However, in the last years the unstoppable development of the digital economy has enormously increased the relevance of those automated decision-making systems. This is mainly due to these factors: (i) the availability of very large volumes of detailed, granular and often personalized data, (ii) the technological developments in data processing, in particular via machine-learning and artificial intelligence systems, and iii) the increased computational power (i.e. more powerful processing resources that can be used by a computer to carry out its tasks).

6. Even assuming a narrow definition of algorithms (i.e. only digital ones), it is possible to distinguish various categories of algorithms, on the basis of different metrics.[7] For the purposes of competition law, probably the most relevant metric is the one based on the task they perform. The most relevant categories are:

- Pricing algorithms: a software-based system that autonomously determines or adjusts prices (or price elements) on the basis of various dynamic input data such as demand, costs, rivals' prices and forecasts. Initially, algorithms were only used in specific sectors where pricing data were easily available, for instance airlines ticketing. With the development of the digital economy, pricing algorithms have been applied in many sectors and they have been refined and improved via the application of the latest technologies;
- Monitoring algorithms: algorithms that allow the collection of multiple types of data, for instance with respect to consumers' behaviour, customers' preferences, market dynamics, competitive conditions;

[4] Reinforcement learning algorithms include a bot (a computer program that operates as an agent for a user or other program or to simulate a human activity) pursuing a goal and receiving - in an iterative way - a reward or a punishment based on the results obtained considering its proximity to the goal. In this context, the bot experiments different strategies, adapting its conduct to market changes and get an evaluation on the success or failure on the results obtained. In general, it should be considered that the definition of an algorithm as an "exact" sequence of commands is less appropriate for the algorithms designed to find their way (within the assigned rules) to achieve a result.

[5] Competition and Markets Authority (2021), Algorithms: How they can reduce competition and harm consumers, p. 4, in relation in particular to "algorithmic systems".

[6] Bundeskartellamt and Autorité de la concurrence (2019), Algorithms and Competition, that limits its analysis to algorithms used for dynamic price setting (p. I).

[7] For a more detailed analysis see Bundeskartellamt and Autorité de la concurrence (2019), Algorithms and Competition, p. 4-14.

- Ranking algorithms: software-based systems that rank items in a dataset according to certain, predetermined criteria. They are widely used in many different sectors and applications, in particular online search and recommendation systems (e.g. marketplaces). [8]

7. Other metrics to classify algorithms include the method of learning (fixed algorithms vs. self-learning algorithms), the degree of interpretability or the identity of the developer.[9] Although these distinctions can also be relevant from a competition perspective[10], the metric based on the functions that algorithms perform appears the most relevant for a theoretical analysis of the main interplay with competition law. For example, pricing algorithms appear *prima facie* relevant as potential means of pricing collusion. Conversely, ranking algorithms seem more prone to be used in possible cases of abusive favouring.

3. Benefits of algorithms

8. As already mentioned in the introduction, it is undisputed that the use of algorithms can bring efficiencies, be procompetitive and generally lead to outcomes that benefit consumers through faster adjustments to prevailing market conditions. [11]

9. Pricing algorithms allow for faster and more accurate price adjustments, taking into account extensive market information. This can improve the matching of fluctuating demand and supply, which makes markets work more effectively and can result in better outcomes for consumers in the form of lower prices or their needs being better met — for example, through shorter waiting times for a ride during peak times. Algorithms can also substantially reduce the costs of setting and changing prices, and facilitate entry by new suppliers, as they can quickly learn how a market works. [12]

10. Machine-learning algorithms (for instance complex search algorithms) are capable of learning from previous use (for instance search queries), thus improving the relevance of subsequent output. Pricing algorithms powered by artificial intelligence may in particular lead to more contestable markets as the frequency of price changes increases, in turn bringing better service, better product availability, or an improved customer

[8] Kumar A., 2022, Ranking Algorithms & Types: Concepts & Examples, where it is explained that ranking algorithms can in turn be divided into two categories: deterministic and probabilistic, depending on whether the order of the items in the ranked list is fixed or can change on the basis of the input data.

[9] Bundeskartellamt and Autorité de la concurrence (2019), Algorithms and Competition, p. 9-13.

[10] It can be considered as an example machine-learning algorithms and their relevance also for imputability purposes: this type of sophisticated algorithms are capable of improving their performance and their behaviour may not be perfectly anticipated by undertakings, in particular with the development of Artificial Intelligence. In any case, developers and undertakings should be held responsible for effective oversight of such systems (Competition and Markets Authority (2021), Algorithms: How they can reduce competition and harm consumers, p. 5).

[11] OXERA (2018), Algorithmic competition, p. 2.

[12] OXERA (2018), Algorithmic competition, p. 4.

experience.[13] This can indirectly benefit consumers by increasing efficiency and effectiveness.

11. Moreover, it has been predicted that the current availability of specialized, independent providers of (pricing) algorithms may in future lead to lower barriers to entry, in particular allowing smaller businesses to take advantage of these systems, thus favouring innovation and competition. [14]

12. Algorithms can also benefit consumers directly, for example recommendation algorithms can provide individual suggestions to consumers allowing them to save time and focus their online searches.

13. The beneficial effects of algorithms are relevant from an EU competition law perspective. If the undertakings involved are able to demonstrate the efficiencies that conducts or practices under investigation may create, this must be taken into account, pursuant to both the rules on restrictive agreements (Article 101 of the Treaty on the Functioning of the European Union - TFEU)[15] and the provisions on abuse of a dominant position (Article 102 TFEU). Therefore, in the assessment of algorithmic practices that are allegedly in violation of EU competition law, the European Commission would have to take into account all demonstrated potential efficiencies brought about by the same practices, to evaluate whether these efficiencies can counterbalance the possible negative effects on competition. [16]

4. Algorithmic conducts

14. As just discussed, algorithms are used in all sectors of the economy and for many different purposes. They can be relevant in horizontal as well as in vertical relationships, for coordinated as well as unilateral conducts. However, the two main types of practice that have attracted the attention of authorities and scholars are algorithmic collusion and algorithmic exclusionary abuses. This section will therefore focus on these two practices.

1.1. Algorithmic collusion

15. Algorithmic collusion is probably the subject that has attracted the most attention from authorities and scholars, although in practice and on the basis of the European Commission's experience, real cases where such conducts have been assessed are not yet common.

[13] Sanchez-Cartas J. M., Katsamakas E. (2022), Artificial Intelligence, Algorithmic Competition and Market Structures, p. 1.

[14] Competition and Markets Authority (2021), Algorithms: How they can reduce competition and harm consumers, p. 5.

[15] See in particular Article 101(3) TFEU, according to which agreements that restrict competition can be compatible with EU competition law if (1) they contributes to improving the production or distribution of goods or to promoting technical or economic progress, while (2) allowing consumers a fair share of the resulting benefit, and in turn (3) not imposing restrictions which are not indispensable and (4) not eliminating competition in respect of a substantial part of the products in question.

[16] However, the presence and demonstration of potential beneficial effects of algorithms does not automatically preclude a finding of restriction of competition by object in case of application of Article 101 TFEU.

16. With respect to collusion, algorithms can play a role both as an element that leads to the collusion (i.e., in the initiation phase), and as an element used to reinforce and monitor the stability of collusion (i.e., in the implementation phase). In general, three specific situations involving different families of algorithms have been identified:

1. Cases where algorithms are used to support or implement a pre-existing collusion: in this situation, the parties to an anticompetitive agreement have already put in place (or agreed to put in place) a traditional collusive practice and the algorithm is only used to support the implementation of the agreement, for example its monitoring, enforcement or concealment; [17]
2. The use of the same third party's algorithm by different competitors. In this case, leaving aside the situation where the competitors explicitly agree to use the same provider/software for the purpose of implementing pre-existing collusion (in that case we will be under case i. above), an alignment of the competitive conditions applied by the rivals can occur, hypothetically without any direct contacts between them;
3. The parallel use by competitors of distinct (pricing) self-learning/deep-learning algorithms that via their automatic, reciprocal interaction can lead to the alignment of the (pricing) behaviour of the rivals or profit-maximisation cartels, although no (human) communications has taken place between them.

1.1.1. Algorithmic facilitation of traditional collusion

17. With respect to the case under point (i), it can be debated whether this potential practice can be classified, strictly speaking, as "algorithmic collusion". If the idea behind this definition is that the collusive behaviour should be a direct and exclusive consequence of the activity and interactions of the algorithm(s), then this case should not be classified as "algorithmic collusion". The algorithm in this case is simply a tool to facilitate or implement a traditional, pre-existing collusive agreement between the parties, an agreement concluded via other non-algorithmic practices. In principle, this situation does not appear to raise any specific competition law issues related to the use of an algorithm, considering that a prior agreement or concerted practice is in place. It is this pre-existing agreement that should be assessed and proven under Article 101 TFEU in order to find an infringement, without any specific need to focus on the actual functioning of the algorithm.

18. However, even in situations where the infringement can be found without direct reference to the algorithm, an analysis of the algorithm, its functioning and its precise role in the implementation of the collusion could be relevant, to assess a series of constitutive elements of the collusion such as actual effects. Therefore, even though in such situations the usual investigative tools and methods used in "traditional" collusion still appear fit for purpose, a greater technical understanding of the algorithm and of its actual functioning could be important to have a more complete picture of the potential infringement.

19. The European Court of Justice's judgment upon a request for a preliminary ruling in the *Eturas* case provides an instructive illustration of this point.[18] A group of Lithuanian travel agencies used a "*common online travel booking system*". The system administrator sent a one-off email to some of the travel agencies, proposing to implement a software rule limiting the possibility of discounts greater than 3% in the online booking system, and

[17] Some examples are in Bundeskartellamt and Autorité de la concurrence (2019), Algorithms and Competition, p. 27-283.

[18] Case C-74/14 Eturas, ECLI:EU:C:2016:42.

inviting them to vote to communicate their agreement or disagreement to this proposal. Although the proposal would not have prevented the travel agencies concerned from granting discounts greater than 3%, they would have been required to take additional technical steps in order to do so. The European Court of Justice found that this would constitute a concerted practice under Article 101 TFEU if it were proven that the travel agencies were aware of that message. The case focused on awareness by the participants of the message sent, namely on the existence of a "pre-existing" agreement or collusion, of which the software rule was simply an implementation.

20. Various analogous scenarios and their logical consequences are conceivable in the abstract. Consider the following examples: (a) scenarios in which online competitors jointly decide to use particular parameters and strategies in their (pricing) algorithms, leading to aligned conditions or market sharing via price differentiation; (b) scenarios in which competitors jointly outsource the implementation of their alignment on pricing decisions to the same third-party algorithm; and (c) scenarios in which pricing algorithms are used to signal pricing intentions or proposals to competitors. In all of these, the main subject of the investigation is the explicit or implicit collusion between the parties, which "pre-dates" – chronologically and logically – the use and role of the algorithm. In all these cases, the European Commission would not see particular issues in the application of Article 101 TFEU and considers that the current legal framework – including the investigative tools at its disposal – would allow us to prosecute such infringements. However, from an investigative perspective, an algorithm is usually used to replace the need for reoccurring direct interactions between undertakings to sustain the collusion. These interactions/reactions are generally relied on by competition authorities to establish the underlying collusion, notably its existence and duration. Although in this scenario it is also possible to rely directly on more traditional concepts in the legal assessment, the use of algorithms could certainly have a relevant impact on the authorities' ability to prove the infringement through the usual investigative tools. A reflection on investigative methods could therefore be necessary.

1.1.2. Algorithmic alignment via a third party

21. The cases described under points (ii) and (iii) are essentially different, in particular as neither of the two assumes the existence of a pre-existing, voluntary anticompetitive agreement between the parties.

22. In particular, the case under (ii) covers the scenario where a third party provides the same algorithm or somehow coordinated algorithms to different competitors and as a consequence there is an alignment between the parties with respect to certain competitive parameters, normally pricing.[19] As already mentioned, in this case, in contrast to the scenarios discussed in the previous section, the use of the same third-party software provider is not the consequence of an anticompetitive scheme already agreed between the parties.

23. As is well known, collusion via a third party is not a novelty under competition law. The role of "facilitator" has been explicitly recognized by the case-law of the European Court of Justice, in particular in cases where the undertaking involved contributes to the implementation of the collusion, even in a subsidiary, accessory or passive role, for example by tacitly approving the cartel and by failing to report it to the administrative

[19] Two different cases have been individuated: alignment at the level of the algorithm (code level) and alignment at the level of the input factors (data level) (Bundeskartellamt and Autorité de la concurrence (2019), Algorithms and Competition, p. 33-34).

authorities.[20] Moreover, collusion via a third party is typical of the so-called "hub and spoke" situation, that however is used to describe a case where the third party's role is limited to passing on information from one competitor to the other, on the basis of a collusive agreement between them.[21] However, these cases imply, once again, the existence of a previous and autonomous agreement between the competitors and therefore are not perfectly applicable to this kind of algorithmic collusion, although some elements can be common.

24. A relevant distinction in this scenario has been made between the case where the competitors, although not voluntarily choosing the same software/algorithm provider for the purpose of colluding, know that they are using the same third-party algorithm, on the one hand, and the case where the competitors are not aware that they are using the same third-party solution, on the other hand:

- In the first case, the relevant question is whether the "awareness" by the parties could be sufficient to find an infringement of Article 101 TFEU, on the basis of common principles of antitrust law.[22] In this respect, it has already been observed that undertakings should be aware of the functioning of any pricing tools provided by third-party contractors, and should take precautions if it is reasonably foreseeable that competitors may adopt the same tools. Moreover, algorithm development firms should engage in efforts to ensure antitrust compliance by integrating safeguards into their software to prevent it from engaging in illegal activity, since they can also be considered liable as cartel facilitators.[23] However, it is fair to say that, as far as the European Commission is aware, these principles have so far not been tested in a pure algorithmic case, where there is no interaction whatsoever between the competitors other that the implicit alignment due to the common software provider.[24] It therefore remains to be seen whether antitrust liability would be found in such cases;
- In a situation where it is not possible to prove that the different parties were aware of the simultaneous use of the same third-party algorithm and of the subsequent alignment of the competitive conditions, the question of the rivals' liability under the rules on restrictive agreements appears even more complex. This is because, in order to establish an infringement, it must be proven that the parties, if not aware of the anticompetitive acts, should at least have reasonably foreseen them and were willing to take the risks. In such cases, the applicability of the EU rules on restrictive agreements would therefore be based on the mere foreseeability of the

[20] Case T-99/04 AC Treuhand v Commission, ECLI:EU:T:2008:256.

[21] See OECD (2019), Executive Summary of the roundtable on Hub-and-Spoke arrangements, DAF/COMP/M(2019)2/ANN4/FINAL.

[22] See in particular Case C-542/14 Remont, ECLI:EU:C:2016:578.

[23] OECD (2019), Executive Summary of the roundtable on Hub-and-Spoke arrangements, DAF/COMP/M(2019)2/ANN4/FINAL, p. 9.

[24] Awareness and foreseeability are assessed on a case by case basis. However, in general an undertaking cannot conveniently decide not to take precautionary measures or not to verify with the service provider the specific functioning of the algorithm and the data used to obtain the desired output. A situation can be imagined where one or more undertakings adopt a pricing algorithm and are requested to provide certain sensible data (i.e. costs or inventory) to optimise prices and maximise profits. The algorithm would then match this data with other info, such as customers' demands. The undertakings should at least verify if the third party provider is using competitors' data in order to have more accurate estimations.

anticompetitive conduct. If it is not possible to assume that the parties should have at least foreseen the anticompetitive conduct, finding an infringement may prove challenging insofar as any resultant parallel behaviour by competitors would be in principle legal under EU competition law.

25. In summary on this point, the European Commission considers that algorithmic "alignment" via a third party can still be tackled by competition law, in particular by the rules on restrictive agreements. However, it is plain that applying the jurisprudentially-established concepts of awareness and foreseeability to such cases of alleged anti-competitive conduct could be challenging, and some future clarifications ultimately through case-law would probably be beneficial.

1.1.3. Algorithmic alignment

26. The last scenario relates to the situation where different (pricing) algorithms could, without explicit instructions to do so, engage in some sort of explicit collusion with each other: algorithms could be able to "communicate" between them. This scenario is intended to reflect algorithms' ability to "read" the same inputs and the respective outputs, and automatically adjust their behaviour such that, in the end, there would be a price optimisation that could lead to collusive equilibria. If this is or were to become possible in the future,[25] the relevant question from a competition perspective is whether the undertakings using such (different) algorithms should remain liable for their behaviour, i.e., whether they should be required to ensure that their respective algorithms do not engage in illegal behaviour.

27. In this respect, it is well established that under Article 101 TFEU (i) an "agreement" requires some form of communication and sense of mutual commitment, so that the parties realise that they have reached a "meeting of minds" or a "concurrence of wills",[26] while (ii) a "concerted practice" means a form of coordination between undertakings, which, without having been taken to the stage where an agreement properly so-called has been concluded, knowingly substitutes for the risks of competition, practical cooperation between them. [27] At the same time, Article 101 TFEU does not deprive economic operators of the right to adapt themselves intelligently to the existing and anticipated conduct of their competitors.[28]

28. Can the algorithmic alignment just described fall within the scope of Article 101 TFEU? In other terms, can a form of independent "algorithmic communication" be considered an agreement or a concerted practice within the meaning of the case-law? And, consequently, can the undertaking using these algorithms be held responsible for the anticompetitive practice? [29] On the one hand, an affirmative reply would be suggested by the observation that, in the end, an algorithm executes the instructions that programmers

[25] It has been argued that autonomous algorithmic collusion in real markets is just a theoretical possibility at the moment given the lack of empirical evidence (Deng A. (2020), Algorithmic Collusion and Algorithmic Compliance: Risks and Opportunities, p. 966). The rapid and massive development of machine-learning algorithms and of artificial intelligence would suggest not to exclude a priori such possibility.

[26] Case T-41/96 Bayer, ECLI:EU:T:2000:242.

[27] Case 40/73 Suiker Unie, ECLI:EU:C:1975:174.

[28] Case 40/73 Suiker Unie, ECLI:EU:C:1975:174.

[29] A partially similar debate is taking place with respect to intellectual property law, i.e. whether creations generated by artificial intelligence can be patented and who should be held responsible for breaches of IP law and copyrights by artificial intelligence.

have given him, i.e. an algorithm would take into account inputs/outputs by competitors' algorithms if it has been instructed to do so. On the other hand, self-learning algorithms, based on artificial intelligence, could evolve and decide autonomously on the data to be analysed and which behavioural models they have to follow to maximise profit. In case this implies reciprocal adaptation to competitors' behaviour, is this a parallel behaviour – that will usually be accepted under competition law – or a collusive outcome, incompatible with competition law?

29. As already reported, there are still doubts on whether this complex and independent "algorithmic communication", where allegedly "collusive" behaviour may not be anticipated and determined by undertakings, is already a realistic scenario or just a possible future development.[30] Realistic or not, some adjustments have already been suggested to tackle this possibility:

- To take an expanded interpretation of the notion of "communication", in order to bring cases of algorithm-enabled price matching within the scope of Article 101 TFEU: through repeated interactions, two firms' pricing algorithms could come to "decode" each other, thus allowing each one to better anticipate the other's reactions. This would not constitute a simple parallel behaviour or an adaptation to the existing and anticipated conduct of their competitors, but a collusive arrangement between competitors;
- To reconsider the current case law according to which, in principle, tacit collusion is not an infringement of Article 101 TFEU. [31]

30. Irrespective of whether any amendments or additions to the rules on restrictive agreements could be useful or necessary, the rationale behind all possible interventions should be that practices that are illegal when implemented offline, should be considered illegal as well when implemented online, even if adopted via the intervention of algorithms. Similarly, undertakings should not automatically avoid liability on the grounds that their conduct on the market was determined by algorithms. An algorithm as any other tool used by an undertaking should be subject to a prior risk assessment to check among others its compliance with the legal obligations (Algorithmic Compliance). These principles should inform any future discussion on algorithmic collusion and any future development of the legislation and the case law in this area.

1.2. Algorithmic exclusionary abuses

31. Recently, it has been argued that the debate about algorithms and competition law has mainly focused on collusion while the implications on abuse of dominance have been largely neglected.[32] Whether this is true or not as regards the academic debate, in reality the most relevant antitrust cases that have dealt with algorithms are exclusionary abuse cases.

32. In general, the relevance of this theory of harm is connected with the prominence of web-based platforms and the increasing importance of on-line transactions and

[30] Bundeskartellamt and Autorité de la concurrence (2019), Algorithms and Competition, p. 53.

[31] European Commission (2017), Algorithms and Collusion - Note from the European Union to the 127th OECD Competition committee on 21-23 June 2017, DAF/COMP/WD(2017)12, p. 8. See Case 48/69 Imperial Chemical Industries, ECLI:EU:C:1972:70; Case T-442/08, CISAC, ECLI:EU:T:2013:188.

[32] Cheng, T.K. and Nowag J., (2023) Algorithmic Predation and Exclusion, 25 J. Bus. L. 41, p. 42.

interactions. Many if not all decisions by automated platforms are based on some sort of ranking algorithms that decide on the basis of predetermined criteria established by the platform developers. A dominant platform could favour in this way its own products and services (or certain products and services) over rivals' products and services offered on its platform. [33]

33. Some recent cases have confirmed the relevance of this theory of harm based in essence on the manipulation of ranking algorithms:

- In *Google Shopping*, the European Commission imposed a fine on Google because it had abused its market dominance as a provider of general search services by giving an illegal advantage to another Google product, its comparison shopping service. Rival comparison shopping services were demoted by two different algorithms that reduced their ranking and affected their visibility. On the basis of the functioning of the algorithms, even the most highly ranked rival comparison shopping service appeared on average only on page four of Google's search results, while Google's comparison shopping service was always given prominent placement. This meant consumers could very rarely find rival comparison shopping services in Google's search results. [34]
- In *Amazon – Buy Box*, the European Commission accepted the commitments offered by Amazon, to address competition concerns related to possible bias in granting third party sellers access to Amazon's Buy Box and Prime programme, which was allegedly leading to preferential treatment of Amazon's retail business or of the sellers that used Amazon's logistics and delivery services. The preliminary investigation concluded that the Amazon algorithm used to identify the products to be included in the premium programmes artificially favoured Amazon retail's offerings in the ranking (and thus the manner in which they were displayed). Amazon committed, inter alia, to treat all sellers equally when ranking the offers for the purposes of the selection of the Buy Box winner. [35]
- In the antitrust suit filed on January 2023 by the US Department of Justice against Google for monopolizing multiple digital advertising technology products,[36] where multiple anticompetitive and exclusionary conducts are alleged, there are references to algorithms and their use to gain advantages over Google's rivals (self-preferential algorithms, algorithmic advantage). The European Commission has opened an investigation about similar practices, to assess whether Google has infringed EU competition rules by favouring its own online display advertising technology services in the "ad tech" supply chain. [37]

34. The relevance of algorithms and of algorithmic manipulation for a finding of an abuse of a dominant position, in particular an exclusionary abuse, is therefore already well

[33] Competition and Markets Authority (2021), Algorithms: How they can reduce competition and harm consumers, p. 25-29.

[34] Case AT.39740 Google Search (Shopping), Decision of 27 June 2017. The decision has been upheld by the General Court of the European Union (Case T-612/17 Google Shopping, ECLI:EU:T:2021:763).

[35] Case AT.40703 Amazon - Buy Box Decision of 20 December 2022.

[36] Available at https://www.justice.gov/opa/press-release/file/1563746/download.

[37] Case AT.40670 Google - Adtech and Data-related practices, Opening of Proceedings of 22 June 2021.

established in practice. It is important to note that the main issues that have emerged in the application of the rules on restrictive agreements to algorithmic collusion (liability, concurrence of will, awareness) are usually not relevant for the application of the rules on abuse of dominant position and this can explain the limited theoretical discussion. Accordingly, "algorithmic exclusion" is already a reality in competition law practice.

35. However, the cases above are about "human" conducts and decisions implemented via algorithms, i.e., they can be compared to the algorithmic facilitation of traditional collusion described above in subsection 4(a)i. These are cases where the algorithm is simply the tool to implement an anticompetitive strategy decided by the management of the undertaking. It remains to be seen whether it is realistic to foresee cases where the abusive conduct is autonomously perpetrated and put in place by the algorithm, on the basis of some artificial intelligence that could evolve and determine autonomously the behaviour to maximise profit. In this case, the questions about liability and awareness could be relevant as well.

36. A different issue is related to the investigation of such cases and to the difficulties to obtain evidence on the role and functioning of algorithms. Big companies tend not to give access to their proprietary algorithms. Without a clear understanding of inputs, outputs and other defining parameters, it can be difficult to understand the behaviour of an algorithm. Moreover, certain conducts can be the result of interactions between different systems or algorithms. It is also questionable whether competition authorities would have the technical competences to assess algorithms properly – most likely it would be necessary to engage specialized consultants in order to do so. In case of transparent outputs, the authorities can have some visibility on the outcome of certain conducts and in general rivals have useful details and market insights that can help "decrypt" the dominant company's behaviour. However, overall, it remains the case that there are greater evidentiary challenges in investigating algorithmic conduct under Article 102 TFEU as opposed to under Article 101 TFEU.

37. Other categories of "algorithmic abuses" are possible, both exclusionary and exploitative.[38] For example, pricing algorithms could be used to put in place systems that target categories of customers or even individual consumers, therefore facilitating forms of discrimination or predatory pricing. Experience in this respect is still limited but the general principles on the application of Article 102 TFEU appear perfectly applicable to such cases.

5. Algorithms, regulation and competition

38. It is not the object of this note to discuss the complex question of the role of regulation in the algorithmic world. However, it has to be briefly observed that in the last years, considering the increasing relevance of algorithms and IT tools in general in the new digital economy, a series of acts have tried to regulate certain aspects of the digital space. At the EU level, the Digital Services Act (DSA)[39] and the Digital Market Act (DMA)[40]

[38] Cheng, T.K. and Nowag J., (2023) Algorithmic Predation and Exclusion, 25 J. Bus. L. 41, mentions predatory pricing, rebates, and tying and bundling.

[39] Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market for Digital Services and amending Directive 2000/31/EC (Digital Services Act), OJ L 277, 27.10.2022, p. 1–102.

[40] Regulation (EU) 2022/1925 of the European Parliament and of the Council of 14 September 2022 on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828 (Digital Markets Act), OJ L 265, 12.10.2022, p. 1–66.

have been adopted to, respectively, create a safer digital space in which the fundamental rights of all users of digital services are protected and to establish a level-playing field to foster innovation, growth, and competitiveness, both in the EU Single Market and globally. Furthermore, the Data Governance Act ("DGA")[41] seeks to increase trust in data sharing, strengthen mechanisms to increase data availability and overcome technical obstacles to the reuse of data. Other instruments are currently undergoing the legislative process.

39. These acts contain provisions that directly or indirectly relate to algorithms.[42] In general, regulation has a role to play in the new digital space and with regard to algorithms in particular. Algorithms are at the core of all digital platforms' business models and are used in nearly all sectors. Based on the instructions received and the inputs collected, they are the "decision-makers" in many interactions with humans. Regulation is thus fundamental to help maintaining a competitive digital space, to protect privacy and personal data, to address harms, to regulate business practices and to monitor in general this new world. The rapid emergence of artificial intelligence has only increased the need for careful and detailed monitoring.[43]

40. This climate gives rise to important points of reflection. What will be the impact of increasingly far-reaching regulation on competition law enforcement? Will competition law still have a role to play with algorithms? The European Commission believes that, as in many other regulated sectors, competition policy and regulation can and have to coexist in this new algorithmic space.[44] Effective competition leads to lower prices and better quality for products and services. Moreover, it promotes innovation and technological advances. Regulation can certainly also help promoting economic growth and consumer benefits, but it normally has other policy objectives, in this case mainly privacy, data protection, safety and consumer protection. The complexity of the digital space certainly suggests that specific regulation and monitoring of important technical details, in particular by specialized authorities with specific competences and skills, could add significant value. However, this should not replace competition enforcement.

41. For practices involving algorithms (as with any other practices), competition law and regulation remain broadly complementary, rarely entering into conflict. They should coexist and be applied together; and in case of overlapping investigations, cooperation is necessary to avoid inconsistent outcomes

[41] Regulation (EU) 2022/868 of the European Parliament and of the Council of 30 May 2022 on European data governance and amending Regulation (EU) 2018/1724 (Data Governance Act), OJ L 152, 3.6.2022, p. 1–44.

[42] Edelson L., Graef. I., Lancieri F. (2023), Access to Data and Algorithms: For an Effective DMA and DSA Implementation, talks about "54 algorithmic transparency and data-sharing obligations that are present in the DMA/DSA package" (p. 7).

[43] Wirtz B.W., Weyerer J.C., Geyer C. (2018), Artificial Intelligence and the Public Sector—Applications and Challenges, International Journal of Public Administration, have individuated three main aspects where regulation has a role to play with respect to AI: governance of autonomous intelligence systems, responsibility and accountability, and privacy/safety.

[44] See European Union, Competition Enforcement and Regulatory Alternatives – Note by the European Union, submitted at the 71st OECD Working Party 2 meeting on 7 June 2021.

6. Conclusion

42. It is reasonable to conclude that, overall, nowadays we remain in the early stages of our collective attempts to conceptualise a legally certain but future-proof approach to the complex interactions between algorithms and competition law. Although the debate has been intense in the last decade, the application in practice is still limited, with the exception of the cases of exclusionary abuses mentioned in previous subsection 4(b).

43. In particular, on algorithmic collusion – intended as collusion where human intervention is limited and the interaction between competitors is determined by complex and self-learning algorithms – many points are still open to debate and the application of the traditional concepts related to restrictive agreements is not straightforward.

44. With respect to cases of abuses of a dominant position, some recent cases have successfully explored the relevance of algorithms to find exclusionary conducts, though as instruments to implement an abusive strategy already determined by the dominant undertaking. It remains to be seen whether other theories of harm can be equally applied to other algorithmic practices and, above all, whether an abuse of a dominant position can be found and sanctioned even in situations where the conduct is determined by the algorithm itself – assuming that this is currently, or will in the future be, possible.

45. In all cases, investigations of algorithmic conducts can be complex and may require specific competences and skills that are not readily available to competition authorities. One common reflection could be whether it is necessary to reinforce the detection methodologies at the disposal of enforcers.